CDC3000

A Novel Precision Scientific Instrument for Bed Bug Detection

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ABSTRACT: Bed bug (Cimex lectularis) populations are on the rise worldwide, rapidly emerging as a dominant pest threat in temporary and permanent human habitation, as well as different modes of transportation. Reports of bites and infestations, from five-star hotels and cruise ships to college dorms and private residences, are becoming more and more common. As the danger of bed bug infestations grow, industry experts agree: early detection and post-treatment testing are two of the most important elements in the fight against these pests.

RESEARCH AND DEVELOPMENT PROGRAM: Our laboratory started investigating chemical ecology of blood feeding arthropods in 1999, firstly working with ticks and then kissing bugs. In 2005, we became aware of the emerging global bedbug problem, and started to apply our established research methodology to this intractable pest. We have researched bedbug responses to a wide range of stimuli including temperature, sound, host odors and physical designs. By videotaping bed bug behavior, we have been able to optimize each component in designing and manufacturing an integrated detection device. The CDC3000 is a precision scientific instrument optimized for the detection of incipient bed bug populations. It is now commercially available for deployment in bed bug IPM programs.

Heat is a critical component of the attraction of bed bugs to the CDC 3000. Electricity is used to create the necessary precise heat gradient to maximize attraction and capture of bed bugs. Literally hundreds of different heat settings and gradients have been tested to develop the precise optimum levels used in the CDC 3000.

The CDC 3000 has a locking mechanism and can be secured on location. This enables the operator to deploy the CDC 3000 and leave it for the prescribed 2-3 hours or overnight without concern of tampering or loss of device.

Capture slides contain a precise adhesive and attractant chemistry combination to optimize captures once the bed bugs enter the trapping device. This proprietary and optimal blend was derived from high throughput screening of >50 individual mammalian host odor compounds, and subsequent combination of those components with the highest activity in olfactometer and arena studies. The capture slide is single use and then provides a physical "document" that can be archived to record detection results and subsequently inform further control measures.

CO_2 is a critical component of the attraction of bed bugs to the CDC 3000. CO_2 is supplied by single use cartridges and a proprietary flow control system that delivers an estimated 10 hours of detection. The optimal CO_2 flow rate was determined through replicated experimental evaluation of increasing dosages. Experimental results suggest that bed bug response is suppressed when CO_2 rates exceed a certain threshold, and and minimal rates rates are insufficient to elicit orientation behavior.

PRECISION SCIENTIFIC INSTRUMENT: The CDC 3000 is a precision scientific instrument that exploits bed bug host seeking behavior , by creating a desirable artificial point source that bed bugs "think" is a blood meal. An optimized combination of CO2, heat and host attractant odor signals emanate from the trap within seconds of the CDC 3000 being deployed. In laboratory tests with adult bed bugs (>7 days post-feeding), the CDC 3000 captures consistently captures >70% of bugs released within 9 ft^2 arenas. We have also built a "Bed Bug Drag Strip" to test orientation over longer distances, and determined that bedbugs will move 12 feet to the CDC3000, and that some bugs can cover 6 square feet in less than 3 minutes. Detailed studies on response time vs distance are ongoing.

Cimex Science launched the initial prototype of the CDC 3000 at NPMA's PESTWORLD '08. Modifications to the initial prototype have been made with input from commercial clients and the research community, and as of February 2009, the CDC 3000 is now available for commercial use as well as collaboration with the research and technical community.

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